Nordic safety research
Use of modern information technology

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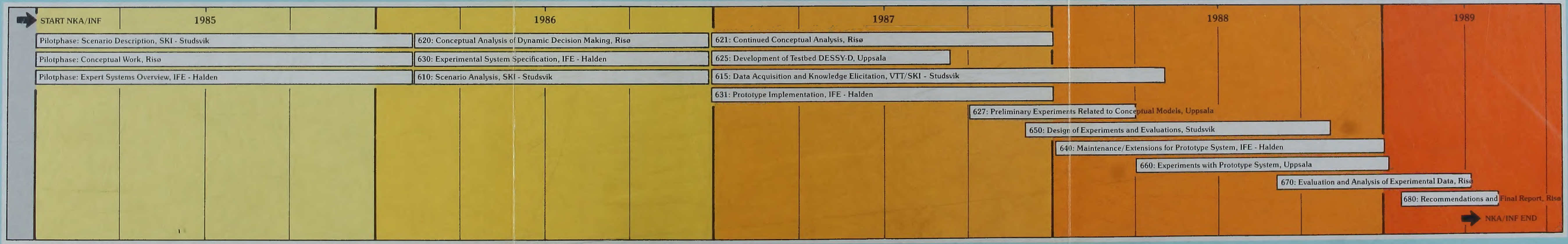
The purpose of this Nordic project is to demonstrate how information technology can contribute to the proper functioning of a preparedness system that will respond to disasters in complex technical plants. The starting point is a developing catastrophe where the aim is to minimize the consequences on the plant itself and the environment. A prototype expert system for a limited part of preparedness will be elaborated and evaluated. Experience gained from this system should decide as to what extent the use of information technology will be realistic considering the time-, personnel-, and other resources that are to be spent in connection with the development of a total preparedness system.

These investigations have been based on work in the nuclear field, but the development of the preparedness system has been adjusted to make the results applicable to off-shore activities as well as those in the chemical industry.

Modern information technology in the form of »expert systems« will be useful in situations where quick decisions are required to avoid accidents. Therefore, a number of potential catastrophes have been investigated, combined with emergency drills and -planning at nuclear power plants. In addition to this, models describing how operators make decisions in critical situations have been developed. Finally, it has been examined how expert knowledge that has to be available to the operators via computers may be collected.

The project started in 1985 and is expected to be finished early in 1989. A time schedule is given below. The project is divided into subprojects, each taken care of by one or more of the participating institutes. An independent report is written for each, and each has a project leader from the institute mentioned in the figure. An important part of the work is to collect basic information to be stored in the database supporting the future expert system. The Technical Research Centre of Finland, VTT, investigates the on-site problems in emergency situations; the data are taken from experiments and drills made at the Loviisa nuclear power station. The Swedish Nuclear Power Inspectorate SKI and Studsvik Energiteknik (Sweden) look into problems concerning the safety of people living in the neighbourhood of a damaged nuclear power plant. These data are extracted from detailed reports on accidents, incidents, and drills in the nuclear power industry. Risø National Laboratory (Denmark) and The Psychological Institute, Uppsala University (Sweden) are occupied with problems related to human errors in the handling of industrial plants. A test programme has been developed to investigate the optimum management for handling emergency situations. The Institute for Energy Technology, IFE, (Norway) is developing a framework in which all of this information may be combined into a prototype expert system.

The final system may be used directly in various complex technical plants, for instance in the chemical industry. The project is financed partly by Nordic grants and partly by national means. The expected total Nordic grant is 5.0 million Danish kroner. Half-way through the programme the Nordic Council of Ministers has granted 2.2 million Danish kroner and the participating organizations have supplied additional work corresponding to 3.1 million Danish kroner. The total budget is therefore expected to be 12 million Danish kroner.


START NKA/INF
1985
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Pilotphase: Scenario Description, SKI - Studsvik
Pilotphase: Conceptual Work, Risø
Pilotphase: Expert Systems Overview, IFE - Halden
620: Conceptual Analysis of Dynamic Decision Making, Risø
630: Experimental System Specification, IFE - Halden
610: Scenario Analysis, SKI - Studsvik
621: Continued Conceptual Analysis, Risø
625: Development of Testbed DESSY-D, Uppsala
615: Data Acquisition and Knowledge Elicitation, VTT/SKI - Studsvik
631: Prototype Implementation, IFE - Halden
627: Preliminary Experiments Related to Conceptual Models, Uppsala
650: Design of Experiments and Evaluations, Studsvik
640: Maintenance/Extensions for Prototype System, IFE - Halden
660: Experiments with Prototype System, Uppsala
670: Evaluation and Analysis of Experimental Data, Risø
680: Recommendations and Final Report, Risø
NKA/INF END

Rec'd: MAR 18 1988
Order No.:
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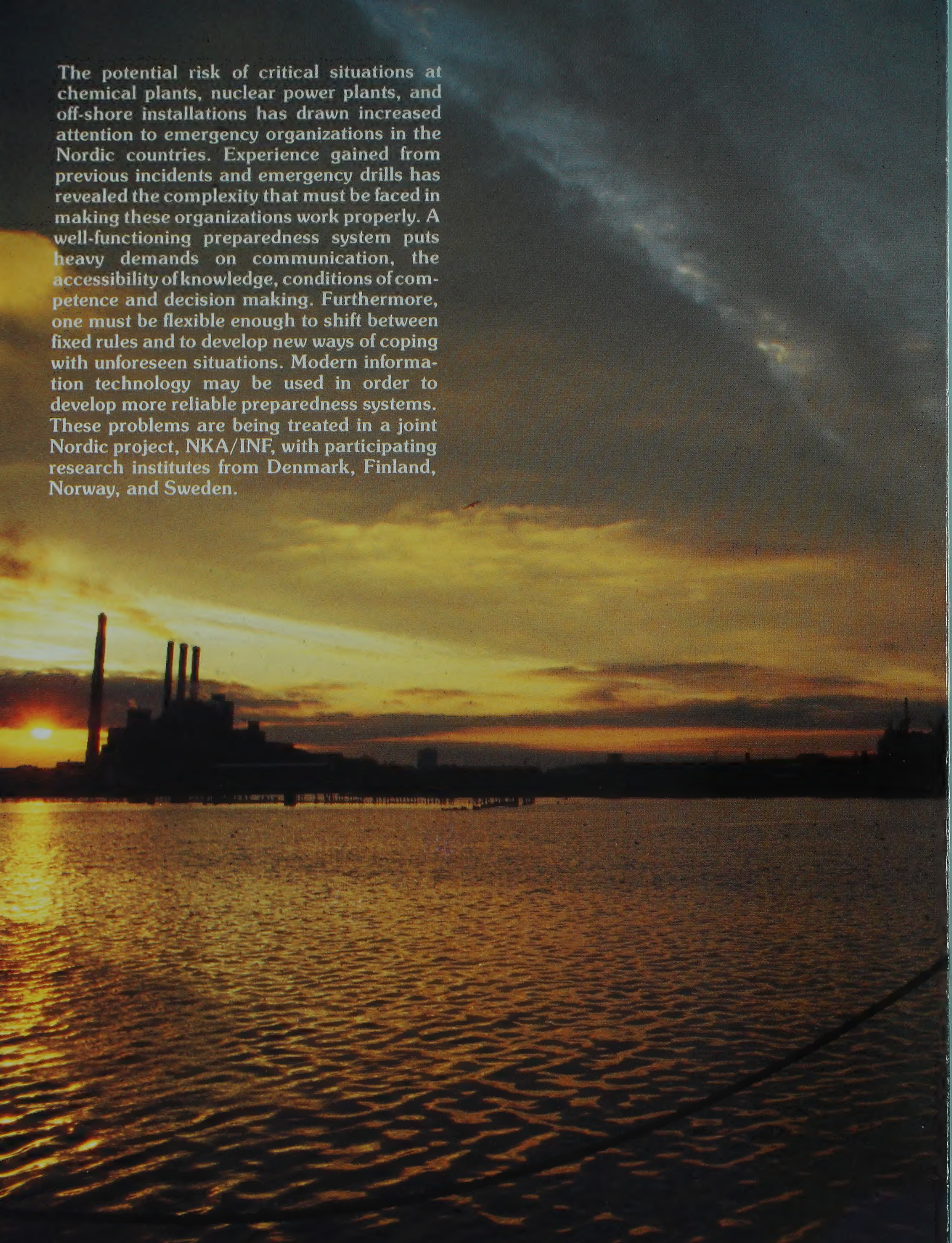
The potential risk of critical situations at chemical plants, nuclear power plants, and off-shore installations has drawn increased attention to emergency organizations in the Nordic countries. Experience gained from previous incidents and emergency drills has revealed the complexity that must be faced in making these organizations work properly. A well-functioning preparedness system puts heavy demands on communication, the accessibility of knowledge, conditions of competence and decision making. Furthermore, one must be flexible enough to shift between fixed rules and to develop new ways of coping with unforeseen situations. Modern information technology may be used in order to develop more reliable preparedness systems. These problems are being treated in a joint Nordic project, NKA/INF, with participating research institutes from Denmark, Finland, Norway, and Sweden.



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5. Scenario description of an emergency and accident situation at a nuclear power plant. Rauno Heinonen and Stefan Jakobsson, Technical Research Centre of Finland, Electrical Engineering Laboratory, 1985.
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Participating Institutions:

Risø National Laboratory, Denmark

Technical Research Centre of Finland,
VTT, Finland

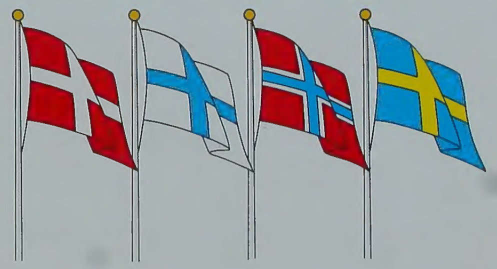
Imatran Voima Oy, Finland

The Institute for Energy Technology,
IFE, Norway

The Swedish Nuclear Power Inspectorate,
SKI, Sweden

Studsvik Energiteknik AB,
Sweden

The Psychological Institute,
Uppsala University, Sweden



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